

Nuclear Regulatory Commission

Pt. 110, App. L

APPENDIX L TO PART 110—ILLUSTRATIVE LIST OF BYPRODUCT MATERIALS UNDER NRC EXPORT/IMPORT LICENSING AUTHORITY^a

Actinium 225 (Ac 225)	Cesium 135 (Cs 135)	Hafnium 181 (Hf 181)	Oxygen 15 (O 15)
Actinium 227 (Ac 227)	Cesium 136 (Cs 136)	Holmium 166m (Ho 166m)	Palladium 103 (Pd 103)
Actinium 228 (Ac 228)	Cesium 137 (Cs 137)	Holmium 166 (Ho 166)	Palladium 109 (Pd 109)
Americium 241 (Am 241)	Chlorine 36 (Cl 36)	Hydrogen 3 (H 3)	Phosphorus 32 (P 32)
Americium 242m (Am 242m)	Chromium 51 (Cr 51)	Indium 111 (In 111)	Phosphorus 33 (P 33)
Americium 242 (Am 242)	Cobalt 57 (Co 57)	Indium 113m (In 113m)	Platinum 191 (Pt 191)
Americium 243 (Am 243)	Cobalt 58m (Co 58m)	Indium 114m (In 114m)	Platinum 193m (Pt 193m)
Antimony 124 (Sb 124)	Cobalt 58 (Co 58)	Indium 115 (In 115)	Platinum 193 (Pt 193)
Antimony 125 (Sb 125)	Cobalt 60 (Co 60)	Iodine 123 (I 123)	Platinum 197 (Pt 197)
Antimony 126 (Sb 126)	Copper 64 (Cu 64)	Iodine 125 (I 125)	Polonium 208 (Po 208)
Arsenic 73 (As 73)	Curium 240 (Cm 240)	Iodine 126 (I 126)	Polonium 209 (Po 209)
Arsenic 74 (As 74)	Curium 241 (Cm 241)	Iodine 129 (I 129)	Polonium 210 (Po 210)
Arsenic 76 (As 76)	Curium 242 (Cm 242)	Iodine 131 (I 131)	Potassium 42 (K 42)
Arsenic 77 (As 77)	Curium 243 (Cm 243)	Iodine 132 (I 132)	Potassium 43 (K 43)
Barium 131 (Ba 131)	Curium 244 (Cm 244)	Iodine 133 (I 133)	Praseodymium 142 (Pr 142)
Barium 133 (Ba 133)	Curium 245 (Cm 245)	Iodine 134 (I 134)	Praseodymium 143 (Pr 143)
Barium 140 (Ba 140)	Curium 247 (Cm 247)	Iridium 192 (Ir 192)	Promethium 145 (Pm 145)
Bismuth 207 (Bi 207)	Dysprosium 165 (Dy 165)	Iridium 194 (Ir 194)	Promethium 147 (Pm 147)
Bismuth 210 (Bi 210)	Dysprosium 166 (Dy 166)	Iron 52 (Fe 52)	Promethium 149 (Pm 149)
Bromine 82 (Br 82)	Einsteinium 252 (Es 252)	Iron 55 (Fe 55)	Radium 223 (Ra 223)
Cadmium 109 (Cd 109)	Einsteinium 253 (Es 253)	Iron 59 (Fe 59)	Radium 226 (Ra 226) ^b
Cadmium 113 (Cd 113)	Einsteinium 254 (Es 254)	Krypton 85 (Kr 85)	Rhenium 186 (Re 186)
Cadmium 115m (Cd 115m)	Einsteinium 255 (Es 255)	Krypton 87 (Kr 87)	Rhenium 188 (Re 188)
Cadmium 115 (Cd 115)	Erbium 169 (Er 169)	Lanthanum 140 (La 140)	Rhodium 103m (Rh 103m)
Calcium 45 (Ca 45)	Erbium 171 (Er 171)	Lead 210 (Pb 210)	Rhodium 105 (Rh 105)
Calcium 47 (Ca 47)	Europium 152 (Eu 152)	Lutetium 177 (Lu 177)	Rubidium 81 (Rb 81)
Californium 248 (Cf 248)	Europium 152 9.2 h (Eu 152 9.2 h)	Manganese 52 (Mn 52)	Rubidium 86 (Rb 86)
Californium 249 (Cf 249)	Europium 152 13 yr (Eu 152 13 yr)	Manganese 54 (Mn 54)	Rubidium 87 (Rb 87)
Californium 250 (Cf 250)	Europium 154 (Eu 154)	Mendelevium 258 (Md 258)	Ruthenium 97 (Ru 97)
Californium 251 (Cf 251)	Europium 155 (Eu 155)	Mercury 197m (Hg 197m)	Ruthenium 103 (Ru 103)
Californium 252 (Cf 252)	Fermium 257 (Fm 257)	Mercury 197 (Hg 197)	Ruthenium 105 (Ru 105)
Californium 253 (Cf 253)	Fluorine 18 (F 18)	Mercury 203 (Hg 203)	Ruthenium 106 (Ru 106)
Californium 254 (Cf 254)	Gadolinium 148 (Gd 148)	Molybdenum 99 (Mo 99)	Samarium 151 (Sm 151)
Carbon 11 (C 11)	Gadolinium 153 (Gd 153)	Neodymium 147 (Nd 147)	Samarium 153 (Sm 153)
Carbon 14 (C 14)	Gadolinium 159 (Gd 159)	Neodymium 149 (Nd 149)	Scandium 46 (Sc 46)
Cerium 141 (Ce 141)	Gallium 67 (Ga 67)	Neptunium 235 (Np 235)	Scandium 47 (Sc 47)
Cerium 143 (Ce 143)	Gallium 72 (Ga 72)	Neptunium 237 (Np 237)	Scandium 48 (Sc 48)
Cerium 144 (Ce 144)	Germanium 68 (Ge 68)	Nickel 59 (Ni 59)	Selenium 75 (Se 75)
Cesium 129 (Cs 129)	Germanium 71 (Ge 71)	Nickel 63 (Ni 63)	Silicon 31 (Si 31)
Cesium 131 (Cs 131)	Gold 195 (Au 195)	Nickel 65 (Ni 65)	Niobium 93m (Nb 93m)
Cesium 134m (Cs 134m)	Gold 198 (Au 198)	Niobium 94 (Nb 94)	Niobium 95 (Nb 95)
Cesium 134 (Cs 134)	Gold 199 (Au 199)	Niobium 97 (Nb 97)	Niobium 97 (Nb 97)
	Hafnium 172 (Hf 172)	Nitrogen 13 (N 13)	Silver 105 (Ag 105)
		Osmium 185 (Os 185)	Silver 110m (Ag 110m)
		Osmium 191m (Os 191m)	Silver 111 (Ag 111)
		Osmium 191 (Os 191)	Sodium 22 (Na 22)
		Osmium 193 (Os 193)	Sodium 24 (Na 24)
			Strontium 85 (Sr 85)
			Strontium 89 (Sr 89)
			Strontium 90 (Sr 90)
			Strontium 91 (Sr 91)
			Strontium 92 (Sr 92)
			Sulphur 35 (S 35)

^a Any accelerator-produced material produced, extracted, or converted for use for a commercial, medical, or research activity.

^b Discrete sources of radium-226 (Ra-226).

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Tantalum 182 (Ta 182)	Tellurium 131m (Te 131m)	Tungsten 181 (W 181)	Yttrium 88 (Y 88)
Technetium 96 (Tc 96)	Tellurium 132 (Te 132)	Tungsten 185 (W 185)	Yttrium 90 (Y 90)
Technetium 97m (Tc 97m)	Terbium 160 (Tb 160)	Tungsten 187 (W 187)	Yttrium 91 (Y 91)
Technetium 97 (Tc 97)	Thallium 200 (Tl 200)	Vanadium 48 (V 48)	Yttrium 92 (Y 92)
Technetium 99m (Tc 99m)	Thallium 201 (Tl 201)	Xenon 131m (Xe 131m)	Yttrium 93 (Y 93)
Technetium 99 (Tc 99)	Thallium 202 (Tl 202)	Xenon 133 (Xe 133)	Zinc 65 (Zn 65)
Tellurium 125m (Te 125m)	Thallium 204 (Tl 204)	Xenon 135 (Xe 135)	Zinc 69m (Zn 69m)
Tellurium 127m (Te 127m)	Thulium 170 (Tm 170)	Ytterbium 175 (Yb 175)	Zinc 69 (Zn 69)
Tellurium 127 (Te 127)	Thulium 171 (Tm 171)	Yttrium 87 (Y 87)	Zirconium 93 (Zr 93)
Tellurium 129m (Te 129m)	Tin 113 (Sn 113)	[58 FR 13005, Mar. 9, 1993, as amended at 59 FR 48998, Sept. 26, 1994. Redesignated and amended at 61 FR 35603, 35607, July 8, 1996; 65 FR 70292, Nov. 22, 2000; 71 FR 20339, Apr. 20, 2006; 75 FR 44093, July 28, 2010]	Zirconium 95 (Zr 95)
Tellurium 129 (Te 129)	Tin 123 (Sn 123)		Zirconium 97 (Zr 97)
	Tin 125 (Sn 125)		
	Tin 126 (Sn 126)		
	Titanium 44 (Ti 44)		
	Tritium (H3)		

APPENDIX M TO PART 110—CATEGORIZATION OF NUCLEAR MATERIAL^d
[From IAEA INFCIRC/225, Rev. 1]

Material	Form	Category		
		I	II	III ^e
1. Plutonium ^a	Unirradiated ^b	2 kg or more	Less than 2 kg but more than 500 g.	500 g or less.
2. Uranium-235 ^c	Unirradiated: ^b Uranium enriched to 20 pct U ²³⁵ or more. Uranium enriched to 10 pct U ²³⁵ but less than 20 pct. Uranium enriched above natural, but less than 10 pct U ²³⁵ .	5 kg or more	Less than 5 kg but more than 1 kg. 10 kg or more	1 kg or less. Less than 10 kg. 10 kg or more.
3. Uranium-233	Unirradiated ^b	2 kg or more	Less than 2 kg but more than 500 g.	500 g or less.

^aAll plutonium except that with isotopic concentration exceeding 80 pct in plutonium-238.

^bMaterial not irradiated in a reactor or material irradiated in a reactor but with a radiation level equal to or less than 100 r/d/h at 1 m unshielded.

^cNatural uranium, depleted uranium, thorium and quantities of uranium enriched to less than 10% not falling into Category III should be protected in accordance with prudent management practice.

^dIrradiated fuel should be protected as category I, II, or III nuclear material depending on the category of the fresh fuel. However, fuel which by virtue of its original fissile material content is included as category I or II before irradiation should only be reduced one category level, while the radiation level from the fuel exceeds 100 r/d/h at 1 m unshielded.

^ePhysical security determinations will not be required for 15 g or less of plutonium, uranium-233 or high-enriched uranium, or for 1 kg or less of uranium with an enrichment between 10 and 20 pct in uranium-235.

(Sec. 161, as amended, Pub. L. 83-703, 68 Stat. 948 (42 U.S.C. 2201); sec. 201, as amended, Pub. L. 93-438, 88 Stat. 1243 (42 U.S.C. 5841))

[43 FR 21641, May 19, 1978. Redesignated and amended at 49 FR 47204, Dec. 3, 1984. Further redesignated at 55 FR 30450, July 26, 1990; 58 FR 13005, Mar. 9, 1993; 61 FR 35603, July 8, 1996]

APPENDIX N TO PART 110—ILLUSTRATIVE LIST OF LITHIUM ISOTOPE SEPARATION FACILITIES, PLANTS AND EQUIPMENT UNDER NRC'S EXPORT LICENSING AUTHORITY

- a. Facilities or plants for the separation of lithium isotopes.
- b. Equipment for the separation of lithium isotopes, such as:
 - (1) Packed liquid-liquid exchange columns especially designed for lithium amalgams;
 - (2) Mercury and/or lithium amalgam pumps;
 - (3) Lithium amalgam electrolysis cells;

(4) Evaporators for concentrated lithium hydroxide solution.

[65 FR 70292, Nov. 22, 2000]

APPENDIX O TO PART 110—ILLUSTRATIVE LIST OF FUEL ELEMENT FABRICATION PLANT EQUIPMENT AND COMPONENTS UNDER NRC'S EXPORT LICENSING AUTHORITY

NOTE: Nuclear fuel elements are manufactured from source or special nuclear material. For oxide fuels, the most common type of fuel equipment for pressing pellets, sintering, grinding and grading will be present.